

The rejection further states:

Applicant's specification is directed to a capacitor comprising a tungsten nitride electrode or electrodes, there is no enablement for a tungsten nitride layer including silicon, if the tungsten nitride layer were to include silicon then it would be a tungsten silicon nitride electrode, and not a tungsten nitride layer . . .

Applicant respectfully traverses. The specification clearly indicates that the source gas includes silicon. For example, the specification indicate that the source gas comprises a silicon based gas (page 6 lines 7-9), and that silane or other silicon based gas is added to the source gas mixture at a flow rate that falls within a specific range of the total flow rate of the source gas (page 6 line 20 to page 7 line 8). Furthermore, the source gas is maintained at a pressure conducive to chemical vapor deposition (page 6 lines 9-10). Additionally, the specification indicates that the addition of silane or other silicon-based gas reduces encroachment into any silicon based materials exposed to the tungsten nitride, improves adhesion of the tungsten nitride to its underlying layer, and reduces the bulk resistivity of the tungsten nitride (page 7 lines 1-5). Thus, the addition of the silicon-based gas directly affects the deposited layer. Applicant respectfully asserts that one of ordinary skill in the art would understand that the deposited material includes silicon.

Applicant respectfully points out that the flow rate for the silicon based gas is relatively small with respect to the total flow rate of the source gas. Thus, the amount of silicon deposited is relatively small with respect to the tungsten nitride. Applicant respectfully disagrees with the statement made in the rejection that, *if the tungsten nitride layer were to include silicon then it would be a tungsten silicon nitride electrode*. This statement improperly presupposes that the only way to refer to a layer that includes tungsten, nitrogen and silicon is to refer to it as tungsten silicon nitride, and that the silicon must form chemical bonds with the tungsten and nitride. Such chemical bonds are not automatically formed under the processing conditions provided in the specification. For example, Applicant notes that carbon steel includes carbon that is not chemically bonded.

Applicant respectfully asserts that a tungsten nitride layer including silicon is clearly supported in the specification to one of ordinary skill in the art.

The rejection further states:

furthermore, applicant's specification mentions the use of silane on the deposition of the tungsten nitride layer but no basis is provided for the silicon to be included in the deposited tungsten nitride layer. Furthermore, this would be a process limitation and the claims are directed to a device.

Applicant respectfully traverses. The addition of silane or other silicon-based gas to the source gas reduces encroachment into any silicon based materials exposed to the tungsten nitride, improves adhesion of the tungsten nitride to its underlying layer, and reduces the bulk resistivity of the tungsten nitride (page 7 lines 1-5). Upon reading and comprehending the disclosure, one of ordinary skill in the art will understand that a tungsten nitride material formed by chemical vapor deposition using a source gas that includes silicon will include silicon.

The claims are directed to a device (an end product), which is novel and nonobvious over known devices. Forming the chemically vapor deposited tungsten nitride in which the tungsten nitride is formed using a gas comprising nitrogen, tungsten and silicon provides a patentable end product. The silicon reduces encroachment into any silicon based materials exposed to the tungsten nitride, improves adhesion of the tungsten nitride to its underlying layer, and reduces the bulk resistivity of the tungsten nitride (Specification at page 7, lines 1-4).

§102 and §103 Rejections of the Claims

Applicant notes that the rejection repeats the §102 and §103 rejections that were made in a previous Office Action. Applicant's traversal of those rejections are still applicable.

§102 Rejection of the Claims

Claims 41, 43-48, 51, 58, and 60 were rejected under 35 USC § 102(b) as being clearly anticipated by Mishmash (JP 406275776 A). Applicant respectfully traverses.

With respect to amended independent claim 41, Applicant is unable to find, among other things, in the Matsushita reference a capacitor having a tungsten nitride layer that includes silicon, as recited in the claim. Claims 42 - 45 depend on amended independent claim 41, and

further define the present subject matter. Thus, claims 42 - 45 are believed to be patentable at least for the reasons provided with respect to claim 41.

With respect to amended independent claim 46, Applicant is unable to find, among other things, in the Matsushashi reference a capacitor comprising a second electrode formed as a layer of tungsten nitride that includes silicon, as recited in the claim. Claims 47 - 51 depend on amended independent claim 46, and further define the present subject matter. Thus, claims 47 - 51 are believed to be patentable at least for the reasons provided with respect to claim 41.

With respect to amended independent claim 58, Applicant is unable to find, among other things, in the Matsushashi reference a capacitor comprising a film of tungsten nitride that includes silicon, as recited in the claim. Claims 59 - 61 depend on amended independent claim 58, and further define the present subject matter. Thus, claims 59 - 61 are believed to be patentable at least for the reasons provided with respect to claim 58.

Applicant respectfully requests withdrawal of the rejection, and reconsideration and allowance of claims 41, 43 - 48, 51, 58 and 60.

§103 Rejection of the Claims

Claims 38-40, 42, 49, 50, 52-57, 59, and 61 were rejected under 35 USC § 103(a) as being unpatentable over Matsushashi. Applicant respectfully traverses.

Applicant respectfully traverses the single reference rejection under § 103. Should the Examiner maintain the rejection, Applicant requests the Examiner to cite references in support of the rejection pursuant to M.P.E.P. 2144.03.

With respect to independent claim 38, Applicant is unable to find, among other things, in the Matsushashi reference a showing or suggestion of a capacitor comprising a second electrode formed of chemically vapor deposited tungsten nitride in which the tungsten nitride is formed using a gas comprising nitride, tungsten and silicon, as recited in the claim. This process results in a tungsten nitride layer that includes silicon. The silicon reduces encroachment into any silicon based materials exposed to the tungsten nitride, improves adhesion of the tungsten nitride to its underlying layer, and reduces the bulk resistivity of the tungsten nitride (Specification at page 7, lines 1-4). Claims 39 - 40 depend on independent claim 38, and further define the

present subject matter. Thus, claims 39 - 40 are believed to be patentable at least for the reasons provided with respect to claim 38.

Applicant notes that claim 42 depends on claim 41 and further defines the present subject matter. Thus, claim 42 is believed to be patentable at least for the reasons provided with respect to claim 41. Additionally, Applicant respectfully disagrees with the characterization that forming both electrodes to include tungsten nitride involves a rearrangement of parts.

Applicant notes that claims 49 - 50 depend on claim 46 and further define the present subject matter. Thus, claims 49 - 50 are believed to be patentable at least for the reasons provided with respect to claim 46. Additionally, with respect to claim 50, Applicant is unable to find, among other things, in the Matsushita reference a showing or suggestion that the layer of tungsten nitride is exposed to silicon based materials, and a tungsten nitride / silicon based material boundary is characterized by a reduced encroachment of the tungsten nitride into the silicon based materials, as recited in the claim.

With respect to amended independent claim 52, Applicant is unable to find, among other things, in the Matsushita reference a showing or suggestion of a capacitor comprising a first electrode formed as a layer of tungsten nitride in which the layer tungsten nitride includes silicon, as recited in the claim. Claims 53 - 57 depend on independent claim 52, and further define the present subject matter. Thus, claims 53 - 57 are believed to be patentable at least for the reasons provided with respect to claim 52.

Applicant notes that claims 59 and 61 depend on claim 58 and further define the present subject matter. Thus, claims 59 and 61 are believed to be patentable at least for the reasons provided with respect to claim 58.

Applicant respectfully requests withdrawal of the rejection, and reconsideration and allowance of claims 38 - 40, 42, 49, 50, 52 - 57, 59 and 61.

Claims 62-74 were rejected under 35 USC § 103(a) as being unpatentable over Matsushita in view of Wolf, *Silicon Processing for the VLSI Era, Vol. 2: Process Integration*. Applicant respectfully traverses.

With respect to amended independent claim 62, Applicant is unable to find, among other things, in the Matsushita and Wolf references a showing or suggestion of a capacitor comprising

a film of tungsten nitride that includes silicon, as recited in the claim. Claims 63 - 65 depend on independent claim 62, and further define the present subject matter. Thus, claims 63 - 65 are believed to be patentable at least for the reasons provided with respect to claim 62.

With respect to amended independent claim 66, Applicant is unable to find, among other things, in the Matsushashi and Wolf references a showing or suggestion of a capacitor comprising a film of tungsten nitride formed using: ammonia; tungsten hexafluoride or tungsten carbonyl; and silane, organic silane or a compound that is a multiple order of silane, as recited in the claim. This process results in a tungsten nitride layer that includes silicon. The silicon reduces encroachment into any silicon based materials exposed to the tungsten nitride, improves adhesion of the tungsten nitride to its underlying layer, and reduces the bulk resistivity of the tungsten nitride (Specification at page 7, lines 1-4). Claims 67 - 68 depend on independent claim 66, and further define the present subject matter. Thus, claims 67 - 68 are believed to be patentable at least for the reasons provided with respect to claim 66.

With respect to amended independent claim 69, Applicant is unable to find, among other things, in the Matsushashi and Wolf references a showing or suggestion of a non-planar capacitor where an electrode includes a tungsten nitride layer, and the tungsten nitride layer includes silicon, as recited in the claim. Claims 70 - 74 depend on independent claim 66, and further define the present subject matter. Thus, claims 70 - 74 are believed to be patentable at least for the reasons provided with respect to claim 69.

Applicant respectfully requests withdrawal of the rejection, and reconsideration and allowance of claims 62 - 74.

Response to Arguments

The rejection stated that *the method of forming a device is not germane to the issue of patentability of the device itself*. Applicant respectfully disagrees. Product by process claims are proper (MPEP 2173.05(p) citing *In re Luck*, 476, F.2d 650, 177 USPQ 523 (CCPA 1973)). Forming the electrode using chemically vapor deposited tungsten nitride in which the tungsten nitride is formed using a gas comprising nitride, tungsten and silicon provides a patentable end product. The silicon reduces encroachment into any silicon based materials exposed to the tungsten nitride, improves adhesion of the tungsten nitride to its underlying layer, and reduces

the bulk resistivity of the tungsten nitride (Specification at page 7, lines 1-4). The references relied upon do not show or suggest this end product.

The rejection stated that *there is no single statement in the specification that reads that the layer formed is a "tungsten nitride layer including silicon."* Applicant respectfully asserts that the specification indicates that the source gas used in the chemical vapor deposition process includes a tungsten-containing gas, a nitride-containing gas, and a silicon-containing gas. One of ordinary skill in the art would understand, upon reading and comprehending the disclosure, that the resulting tungsten-nitride includes silicon.

The rejection stated that *if the layer were to include silicon then it would become a tungsten silicon nitride layer (WSiN) which is not mentioned in the specification as being the formed layer.* This statement improperly presupposes a specific chemical bonding between the elements. Applicant respectfully asserts that a tungsten nitride layer including silicon definitely recites an element of the claimed subject matter.

Conclusion

Applicant respectfully requests reconsideration and allowance of the claims. Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney (612) 373-6960 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

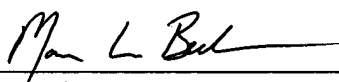
Respectfully submitted,

SCOTT G. MEIKLE ET AL.

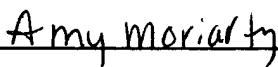
By their Representatives,

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Date 3-17-03

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